screamers; but they are not the only birds which possess this double allowance of extrinsic tracheal muscles. Among the Gallinaceous birds, which present in other points of structure such unexpected likenesses to the Anseres, the same arrangement of the muscles is met with. And the list of birds with two pairs of extrinsic tracheal muscles is not exhausted by the facts mentioned. The number of rectrices in the owls is not invariably twelve, as seems to be implied by Mr. Evans. It is certainly usually so, but one genus is said to possess only ten. This criticism may be fairly regarded as rather pedantic; not so, however, our objection to Mr. Evans' statement that in the owls "the syrinx is bronchial." There is no qualification of this bare sentence, which is only partially true. Many owls, it is well known, do show a purely bronchial syrinx—an interesting likeness to the goat-suckers; but in others the normal tracheo-bronchial syrinx is evident.

At intervals among the exceedingly conscientious descriptions of colour and plumage are to be discovered a few notes upon the customs and habits of the bird tribe. Mr. Evans is particularly emphatic upon the varied sounds and songs—an exceedingly useful part of the subject to lay stress upon. But the tyro, who is probably often puzzled by the notes of a strange bird, will be baffled by the variety of utterances which are described as occasionally pertaining to the same species. One species, for instance, is credited with so great a variety of noises that they can only be expressed by "a bray, a croak, a harsh cackle, a diabolical scream, a puppy's whine, or a soft whistle." "The voice of the goatsucker' is generally hollow, but is described in various cases as a "croak," a "loud shrill cry," a "sad whistle," a "jarring note," or a "moan." We presume that under these extraordinarily diverse tones more than one species is included, though it is not quite apparent from the text. The croaking of the goatsucker reminds us of a slight error in Prof. Newton's "Dictionary of Birds." The professor, under the heading "Night Raven," observes that it is "a bird frequently met with in fiction, but apparently nowhere else." Now it is quite curious that this word immediately follows "Nightjar" in the work referred to—curious because John Hunter, under the heading "Night-Raven," described the anatomy of the nightjar or goatsucker.

Under what may be termed "bionomics," Mr. Evans has some remarks upon mimicry, not condensed into a chapter or section, but scattered through the body of the work. These remarks are not numerous, only four instances being given, or at least noted, in the index. They are entirely among Passerines, and do not include, to our mind, the most striking examples of superficial likeness between birds remote from each other in the system. One of the very best instances is the likeness between the large ground cuckoo *Carpococcyx* and a gallinaceous bird. The cuckoo suggests a pheasant, in its size chiefly and gallinaceous strut, but the colours are not at variance with the view that it represents a genuine case of selective variation in the direction of a gallinaceous model; and it will be remembered that in the birds which the cuckoo suggests there are formidable spurs, which seem to form an excuse for the attempt at protection. But Mr. Evans is unnecessarily redundant when he speaks of this singular phenomenon as "unconscious mimicry"; no one could seriously urge a conscious attempt to put on the appearance of some other bird. But such instances do not form the strongest argument that the believer in mimicry has at his disposal. The advantage is not plain in most cases, and the question of genetic alliance, and therefore genuine likeness based upon affinity, is not to be settled at once. Prof. Garrod, it will be remembered, thought the cuckoos to be not far from the Gallinæ, and there is much to be said for his view.

Such general questions as migration are not neglected by the author. But he has not found space to treat of the matter in a comprehensive way. It may be that more has been written upon this subject elsewhere than it will quite bear; but Mr. Evans has erred—if he has erred—upon the absolutely opposite side. The astounding statements of Herr Gätke upon the prodigious velocity of the migration flight are, we are relieved to find, not accepted; in this matter Mr. Evans might well have quoted Mr. Whitlock's interesting criticisms of Dr. Gätke's calculations. The remarkable way in which individual birds are believed to return to the immediate neighbourhood whence they set forth, is strikingly illustrated by an instance which we have recently seen quoted, though the event itself happened in the year 1834. A gentleman resident in Poland captured a stork and fixed a collar round its neck made of iron, and inscribed "Haec ciconia ex Polonia." The following year the bird returned to his estate, but this time with a golden collar bearing the inscription, "India cum donis mittit ciconia polis." We can answer for the accuracy of the quotation, though the grammar seems to have suffered on behalf of the scansion.

The concluding remark which we have to offer about Mr. Evans' book can contain nothing but praise. The illustrations are most admirable, which indeed might be expected from their author, Mr. G. E. Lodge. The majority, at any rate, are by that well-known draughtsman; some few are from other sources. F. E. B.

A LADY'S DIGGINGS IN EGYPT.

The Temple of Mut in Asher: an Account of the Excavation of the Temple and of the Religious Representations and Objects found therein, as illustrating the History of Egypt and the main Religious Ideas of the Egyptians. By Margaret Benson and Janet Gourlay; the inscriptions and translations by Percy E. Newberry. Pp. xvi + 391. (London: John Murray, 1899.)

THE Egyptian goddess Mut was the wife of the god Ȧmen-Rā and the second member of the great Theban triad of deities, which consisted of herself, her spouse Ȧmen-Rā and her son Chonsu, the god of the Moon. She symbolised nature and was regarded as the mother of all things, as indeed her name *Mut*, "the mother," implies. Her temple at Karnak, situated in a district termed *Ȧsher* by the ancient Egyptians, stood to the south-west of the great temple of Ȧmen-Rā, to which it was connected by a long avenue of sphinxes. A little to the north-west stands the temple of Chonsu, her son, from which another avenue of sphinxes led to Luxor.

Her temple is thus, with the exception of a small temple of Rameses III., the southernmost of those that form the Karnak group. Although in consequence of its ruined condition it, perhaps, receives little attention from the passing tourist, its importance has long been recognised, and it has been frequently studied and described. As Mariette pointed out, although its structure has suffered more than that of others at Karnak, its interest is considerable; for we have in it an entire temple, with its surrounding wall, its pylons, sphinxes and sanctuary, and its sacred lake, which encloses the temple on the south in the form of a great horse-shoe.

Towards the middle of the present century the condition of the temple was probably very much more perfect than it is at present, for about the year 1840 it appears to have been used, with Mohammed Ali's permission, as a stone-quarry during the erection of a saltpetre manufactory in the neighbourhood. The British Museum possesses two manuscript maps of the temple by Burton and Hay, which were probably made between 1830 and 1840; and as Burton's evidently belongs to the period before the saltpetre factory was built, its value as evidence of the former condition of the temple is great. At this period the walls may have stood several feet above the ground, so that the ground-plan of the temple could be traced without difficulty. After they had been levelled, the plan of the temple could only be made out by removing the débris from the bases of columns and the foundations of walls that still remained.

Neither of the plans of the temple made by Burton and Hay was published, and the first published plan is that of Lepsius, made during the Prussian Survey in the years 1842-45. In 1869 Duemichen published a copy of part of the inscription of the time of Tirhakah from the walls of a small chamber in the temple, and in June 1872 de Rougé read a paper before the Academie des inscriptions, in which he translated passages from the inscription Duemichen had published. Since Lepsius' survey, however, no detailed examination of the temple was undertaken until Mariette partly excavated the site, and in 1875 published in his "Karnak" the results of his excavation in the form of the plan which has been regarded as the authoritative plan of the temple up to the present time. Mariette also published a fuller copy of the inscription from the chamber of Tirhakah, which was again republished in 1890 by M. Urbain Bouriant, together with another mutilated inscription from the western wall of the temple. In 1891-93 Sir Norman Lockyer spent three seasons in Egypt studying the orientation of the principal Egyptian temples, among which he included the temple of Mut; as the result of his investigations, he provisionally assigned the date of its foundation to about B.C. 3500.

Such is a brief sketch of the principal surveys and studies of the temple and its inscriptions that had been made up to the time Miss Benson began her work on the site. After a visit to Egypt in 1894, Miss Benson tells us she first entertained the idea of undertaking some excavation, and in the following year she obtained permission to clear away some of the earth that still covered the ruins of the temple of Mut. For three seasons Miss Benson and her friend, Miss Gourlay, have occupied themselves in removing débris, and, though they have made no very startling discoveries, they have succeeded in correcting Mariette's plan of the temple in several details, and in the course of their work have found a number of inscribed statues and fragments.

The first year of excavation was devoted to the outer court of the temple, and did not yield many finds, the most important being a statue of a royal scribe with the cartouche of Ȧmenḥetep II.; and as this was found apparently *in situ*, it served to throw back the date of the temple's foundation, which Mariette had assigned to Ȧmenḥetep III. During the next two seasons the colonnaded court, the hypostyle hall, and the chambers built around the sanctuary of the goddess were cleared. Mariette, in his plan, though in the main correct, had indicated that these chambers were arranged symmetrically; but Miss Benson, by a more complete clearing of the foundations, has shown that such a symmetrical arrangement was not strictly adhered to. It was to be hoped that her excavation would have rendered it possible to assign dates to the various portions of the temple, and this has been done for several portions that were left uncertain by Mariette; unfortunately, however, sufficient evidence has not been found for dating considerable parts of the structure. In his "Dawn of Astronomy" Sir Norman Lockyer has emphasised the importance of ascertaining such dates where possible, for subsequent additions to a temple may considerably interfere with the original design of its orientation. The fresh data obtained by Miss Benson, however, so far as they go, are in favour of the early period assigned to the foundation of the temple by Sir Norman Lockyer.

Of the finds made by Miss Benson in the course of her excavation, the seven fragments of inscribed stelæ and the inscriptions on the Sekhet statues are unimportant. Of the thirty-one inscribed portrait-statues and fragments, perhaps the most interesting is a statue of Sen-Mut, the architect of Queen Ḥātshepset, who reigned about B.C. 1600. Ḥātshepset's name is chiefly associated with the beautiful temple at Dêr el-baḥari, on one of the walls of which is sculptured her famous expedition to the land of Punt. The erection of this temple was the chief architectural work of her reign, and Sen-Mut was the architect who carried out her instructions. In the statue found by Miss Benson he is represented kneeling and holding before him a Hathor-headed shrine, while both the body of the statue and its pedestal bear inscriptions giving his parentage and the offices he held. That Sen-Mut was the queen's favourite, and a powerful official, is well attested by the records that we have of him. Another statue of him and his funeral stela are preserved at Berlin, while his portrait is sculptured in one of the compositions at Dêr el-baḥari; from these monuments, and from an inscription on the rock at Aswân the main facts concerning Sen-Mut's career have long been known. Another find of some interest are five blocks of stone which formed part of a wall of a chamber in the temple built by Piānchi, King of Ethiopia, about B.C. 766. From the sculptures on them we learn that this monarch, following Queen Ḥātshepset's example, undertook a foreign expedition with the object of bringing the riches of the South to Thebes. The ships which formed the expedition are represented returning laden with cargo, and from the plants, palm-nuts, &c., depicted, it seems not improbable that the expedition penetrated to the region south of Khartûm. The blocks are roughly carved, and of course, whether from an artistic or historical point of view, cannot be compared with the famous reliefs of the expedition to Punt; but they, at least, bear witness to a foreign expedition of Piānchi that is not elsewhere recorded.

It will be seen, therefore, that Miss Benson and Miss Gourlay have had some reward for their three seasons' work; and, although surface-excavation at Karnak is not a very arduous or difficult undertaking, it is not unreasonable that they should be proud of having obtained the first permission to excavate given to women in Egypt. Whether their example will be followed by other ladies remains to be seen, though we think on the whole such work is perhaps better left to the male professional digger, who can camp on the spot, and having a knowledge of Arabic is naturally better able to control his men, and can check to some extent the thefts of the smaller antiquities. Of the general plan of the book in which Miss Benson and Miss Gourlay, with Mr. Newberry's help, have published the results of their work, one word must be said. The excavation of a temple site, which results in correcting a previously published ground-plan, and in recovering a number of statues of secondary importance, is of the highest interest to the expert, but does not appeal to the general public. Yet Miss Benson has more than doubled the size of her book by adding sketches of the religion and the history of Egypt. In the preface it is stated that this has been done for the benefit of those who, "without technical knowledge, feel the fascination and interest of Egypt." But for this class of reader it cannot be said that at the present day there is any lack of sound popular histories. In fact, in describing her diggings, Miss Benson should have addressed herself only to the expert; he would have been contented with Parts ii. and v. of the book, and the result would have been a very much handier volume.

OUR BOOK SHELF.

Die Medial-Fernrohre. By L. Schupmann. Pp. 145. (Leipsig: B. G. Teubner, 1899.)

Every one is familiar in a general way with the optical parts of a reflector and refractor, the former containing in its optical series a parabolic reflector with a smaller reflector and eyepiece, and the latter consisting of an objective of two different kinds of glass for the elimination of colour, and the necessary eyepiece near the focus.

The "medial-fernrohr" and "brachymedial-fernrohr," both of which are discussed here, may each be described generally as being a combination of a refractor and reflector, for the functions of both an objective and a curved reflecting surface are required.

In the principle involved in this new method of construction it is possible to produce an achromatic telescope with the employment of only one *kind* of glass, and the author, who had a telescope made as a preliminary trial of the system he was investigating, says "derartige Systeme hätten also zur Not schon konstruiert werden können, bevor man die verschiedene Dispersion der Glasarten kannte."

The achromatism in the telescopes here under discussion is obtained by making the objective of one kind of glass, and, before the focus is reached, of intercepting the light rays by a curved mirror near the surface of which another lens of a different kind of glass is placed. The light rays thus pass twice through the second lens.

In these pages the author takes the case of the medial-fernrohr first, and discusses the optics of its system very thoroughly, using terms in the discussion which are generally considered inappreciable in other systems. The result of the investigation speaks very highly for this class of instrument, and the greater the aperture the more efficient does it seem to become. It would naturally be thought that the employment of two lenses and a reflector would tend to diminish very considerably the brightness of the image, especially as the rays pass twice through one of the lenses. We are told, however, that comparing an ordinary refractor and a "medial" of 12 cm. aperture, the brightness of the image in the case of the former exceeds that of the latter by 15 per cent.; but comparing apertures of 34 cm., the medial has the advantage of 7 per cent. For equal apertures of 1 metre the "medial" exceeds the refractor by as much as 30 per cent.

Towards the latter part of this volume the author describes the method of mounting and adjusting an instrument of large dimensions. He then discusses the "brachymedial" telescope, adapting the formulæ obtained in the previous portion of the book to this form of instrument. Here he also describes a telescope of large aperture on this principle, but although optically it does not attain the efficiency of the "medial," yet the fact, that the length of the tube is very considerably shortened by a more compact arrangement of the optical parts, may counterbalance this deficiency.

In conclusion, we recommend to our astronomical and physical readers the work before us; for it is only by such investigations that further advance in our present instrumental equipment can be made.

Mathematical and Physical Tables. By James P. Wrapson and W. W. Haldane Gee. Pp. viii + 215. (London: Macmillan and Co., Ltd., 1898.)

In these pages the compilers have brought together a most useful set of tables and formulæ which should be found of great service, both in the class-room and laboratory. The first part of the book is devoted simply to tables: these include, among others, four-place logarithms and antilogarithms, natural and logarithmic sines, cosines, and tangents, tables of squares, square roots, cube roots, &c. In the next section the reader has brought before him the chief formulæ in pure and applied mechanics; here, for example, he can find at a glance the lengths of curves, areas and volumes of solids, plane and spherical trigonometrical formulæ, formulæ used in analytical geometry, and others connected with dynamics, pendulums, elasticity, and hydraulics.

The other sections, the contents of which are too numerous to mention, consist of tables of pure and applied physics, which should be found very useful, and formulæ in pure and applied physics, which include optics, heat, magnetism, electrostatics, electro-chemistry, electro-magnetic induction, and alternating currents, &c. The volume concludes with an appendix containing other useful miscellaneous information, and an index.

If the book be used judiciously, and employed simply as a means of reminding the student of formulæ and data which may have grown rusty by disuse, its value is to be recommended; but it should not be given to young students, who would probably work out problems without knowing the why and wherefore of the expressions they are using.

For neatness and conciseness, and the numerous clearly printed diagrams, the volume will be found a desirable source of information, and considerable pains seems to have been taken to bring the data up to date.